

REMARKS

The specification was objected to as not being in double column format. The Examiner stated that the applicants are required to submit a full copy of the printed patent, including the front page. In compliance with this request, a full copy of the issued patent US 5,706,819 is enclosed to provide the abstract, specification, claims and drawings in the required format.

Applicants were required to provide a full listing of the claims with the claims new to the patent (Claims 5-25) underlined as required by 37 CFR §1.173(d). A listing of the claims in this format is provided above and in the Appendix to this submission.

In a previous submission of January 6, 2006 the subject matter of the Certificate of Correction to the original patent, claiming the benefit of a provisional application, was added at the beginning of the specification. The Examiner has pointed out that since this Certificate is part of the original patent it should not be underlined as it is already included in the original patent. Accordingly, this amendment is presented above but without underlining.

The supplemental declaration filed on December 13, 2007 was said to be defective for several reasons. The Examiner has suggested using the PTO's form PTO/SP51 for the reissue declaration to address several of these defects. Applicants have followed this suggestion and enclose a supplemental declaration which resolves the defects noted by the Examiner. The new supplemental declaration identifies this application by application number and filing date. The new supplemental declaration acknowledges the duty to disclose all information

known to be material to patentability. The new supplemental declaration states that the errors being corrected arose without any deceptive intention on the part of the applicants. The new supplemental declaration identifies errors corrected in each independent claim with reference to the claims of the original patent. For instance, the original claims call for transmitting first and second ultrasound pulses of different polarity which, as the preamble states, will detect the response of a contrast agent. New Claim 5 calls for transmitting at least three ultrasonic pulses which are more broadly described as having different characteristics that cause a reduction in the linear echo response when the echoes are combined. As the preamble of Claim 5 states, this will detect the nonlinear response of a substance within the body. New Claim 17 calls for accumulating echoes from at least three ultrasonic pulses to produce a nonlinear response. The original claims fail to state a claim with such a requirement. New Claim 20 calls for combining echoes from at least three ultrasonic pulses to produce a nonlinear response, whereas Claim 1 only calls for combining first and second harmonic responses. The errors in the original claims in failing to recite and claim this subject matter is corrected by the addition of new Claims 5-25.

Claims 1-25 were rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over commonly owned US Pat. 5,951,478. Enclosed is a terminal disclaimer which is signed by the registered attorney of record. It is respectfully submitted that the terminal disclaimer overcomes the double patenting rejection.

The Examiner has stated that Claims 1-25 would be allowable if applicants comply with all formal requirements of

the Office action. Applicants respectfully submit that the submissions described above comply with all of the stated formal requirements and that therefore Claims 1-25 are now allowable.

The prior art made of record and not relied upon has been reviewed and is not believed to affect the patentability of Claims 1-25 herein.

In continuing compliance with 37 CFR 1.178(b), it is noted that the original patent no. 5,706,819 is not and has not been involved in any prior or concurrent proceeding, including interferences, reissues, reexaminations, and litigation.

All of the information which is material to the patentability of the present application has, to the best of the knowledge of those with a duty to do so, been brought to the attention of the Examiner in this application.

In view of the fact that applicants have complied with all of the requirements of the Office action of August 25, 2010, it is respectfully submitted that Claims 1-25, which include original Claims 1-4 and new Claims 5-25, are now in condition for allowance. Favorable reconsideration is respectfully requested.

Respectfully submitted,

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APPENDIX: STATUS OF CLAIMS AS OF DECEMBER 22, 2010

1. (original; pending) A method of ultrasonically detecting the ultrasonic response of an ultrasonic contrast agent comprising the steps of: transmitting a first ultrasonic pulse to said ultrasonic contrast agent to cause a first harmonic response;

transmitting a second ultrasonic pulse of a different polarity than said first ultrasonic pulse to said harmonic contrast agent to cause a second harmonic response;

detecting said first and second harmonic responses; and combining said first and second harmonic responses.

2. (original; pending) The method of claim 1, wherein said step of combining comprises summing said first and second harmonic responses.

3. (original; pending) The method of claim 1, wherein said step of combining comprises integrating said first and second harmonic responses.

4. (original; pending) The method of claim 1, wherein said transmitting step comprises transmitting pulses which exhibit a pulse energy which is within a range which causes microbubbles of said ultrasonic contrast agent to oscillate without substantial microbubble destruction.

(new; pending) 5. A method of ultrasonically detecting the nonlinear response of a substance within the body comprising the steps of:

transmitting at least three ultrasonic pulses into the body which exhibit first and second characteristics that cause a reduction in the linear echo response when echoes received

in response to such pulses are combined;
receiving echoes in response to said ultrasonic pulses;
and
combining said echoes to produce a nonlinear response.

(new; pending) 6. The method of Claim 5, wherein said step of receiving echoes comprises receiving echoes from a given location in the body.

(new; pending) 7. The method of Claim 5, wherein said ultrasonic pulses are transmitted in a sequence in which said first and second characteristics are alternated from pulse to pulse.

(new; pending) 8. The method of Claim 5, wherein said step of combining comprises summing pairs of echoes.

(new; pending) 9. The method of Claim 5, wherein said ultrasonic pulses are transmitted in a sequence in which said first and second characteristics are alternated from pulse to pulse; and
wherein said step of combining comprises summing pairs of echoes from successive pulses.

(new; pending) 10. The method of Claim 5, wherein said first and second characteristics comprise first and second polarities.

(new; pending) 11. The method of Claim 10, wherein said transmitted ultrasonic pulses are of the form {p -p p ...}.

(new; pending) 12. The method of Claim 5, wherein said step of combining produces a sum result S which is substantially equal to $S = \sum_{j=1}^{n-1} (E_j + E_{j+1})$, where E_j and E_{j+1} are

pulse echoes.

(new; pending) 13. The method of Claim 12, wherein the number of ultrasonic pulses which is transmitted is three.

(new; pending) 14. A method of ultrasonically detecting the nonlinear ultrasonic response of a medium inside the body comprising the steps of:

transmitting a first ultrasonic pulse to said medium to cause a first echo response;

transmitting a second ultrasonic pulse to said medium to cause a second echo response;

transmitting a third ultrasonic pulse to said medium to cause a third echo response which is substantially the same as said first echo response; and

combining said first, second and third echo responses to produce a nonlinear response.

(new; pending) 15. The method of Claim 14, wherein said transmitted ultrasonic pulses are of the form {p -p p}.

(new; pending) 16. The method of Claim 14, wherein said step of combining produces a sum result S which is

substantially equal to $S = \sum_{j=1}^{n-1} (E_j + E_{j+1})$, where E_j and E_{j+1} are

pulse echoes.

(new; pending) 17. A method of ultrasonically detecting the nonlinear response of a substance within the body comprising the steps of:

transmitting at least three ultrasonic pulses into the body in a sequence which is of the form {p -p p -p ... -p p};

receiving echoes in response to said ultrasonic pulses which comprise a sequence of the form { E_1 E_2 E_3 E_4 ... E_{n-1} E_n };
and

accumulating said echoes to produce a nonlinear response.

(new; pending) 18. The method of Claim 17, wherein said step of accumulating comprises accumulating pairs of consecutive echoes.

(new; pending) 19. The method of Claim 17, wherein said step of accumulating produces a sum result S which is substantially equal to $S = \sum_{j=1}^{n-1} (E_j + E_{j+1})$, where E_j and E_{j+1} are pulse echoes.

(new; pending) 20. A method of ultrasonically detecting the nonlinear response of a substance within the body comprising the steps of:

transmitting a sequence of at least three ultrasonic pulses into the body which exhibit a transmit characteristic which alternates from pulse to pulse;

receiving echoes in response to said ultrasonic pulses;
and

combining said echoes to produce a nonlinear response.

(new; pending) 21. The method of Claim 20, wherein said pulses are transmitted to a given location in the body; and wherein said step of combining reduces the primary component of said echoes and produces a harmonic response.

(new; pending) 22. The method of Claim 20, wherein said step of transmitting produces a sequence of echoes relating to a given location in the body in which the phase of the primary component of echoes produced by one transmit characteristic is out of phase with the phase of the primary component of echoes produced by the alternate transmit characteristic.

(new; pending) 23. The method of Claim 22, wherein said

step of combining reduces the primary component of the combined echoes and produces a harmonic response.

(new; pending) 24. The method of Claim 23, wherein said transmit characteristic is a polarity differential from pulse to pulse.

(new; pending) 25. The method of Claim 23, wherein said transmit characteristic is a phase differential from pulse to pulse.